PATENT SPECIFICATION

Convention Date (Germany): Oct. 19, 1927.

299,013

Application Date (in United Kingdom): Oct. 17, 1928. No. 30,001 / 28.

Complete Accepted: May 16, 1929.

COMPLETE SPECIFICATION.

Improvements in and relating to Means for Reducing the Eddy Current Losses in the Windings of Alternating Current Machines.

We, INTERNATIONAL GENERAL ELECTRIC COMPANY INCORPORATED, of 120, Broadway, New York, United States of America, Merchants, a Corporation organised under the laws of the State of New York, (Assignees of ALLGEMEINE ELEKTRICITÄTS-GESELLSCHAFT, of Friedrich Karl-Ufer 2—4, Berlin, N.W., Germany, a German Company), do hereby declare the nature of this invention and in what manner the same is to be performed, to be particularly described and ascertained in and by the following statement:—

It is known that the stray field of alternating current machines on passing through solid constructional and winding parts at the ends of the machine occasions eddy current losses. For this reason the massive connecting strips have been divided up in a similar manner to the slot conductors exposed to the slot stray field, and the part strips have been twisted, plaited or crossed. However, as this sub-division was employed exclusively in the case of connecting strips, that is to say, only in the winding sections which connect together the extreme ends of the winding bars projecting in a straight line out of the slot, therefore the losses which occur at the free ends of the bars, especially when the bars are constructed with wide flat part conductors, were not influenced thereby.

The present invention has for its object the reduction of the eddy current losses also brought about by the stray field in the conductor ends projecting out of the stator slots. In order to effect this, the sides of the straight flat conductor ends are split by cuts, preferably as far as the slot inlet, into two or more part ends, and each of these part ends is insulated from the other and is so connected by end connectors with the corresponding part end of the split flat conductor end of the other coil side that the E.M.Fs induced by the stray field in the split flat conductor ends are cancelled.

The accompanying drawings shows the nature of the invention in two constructional examples, namely Fig. 1 and Fig. 2. In the slots of the stator iron A lie the made up bars a and b of a coil arranged in layers and consisting of six crossed flat conductors. The free ends of the bars extend towards the outlet of the slot axially as far as the extension for the end connections. Since, for carrying out the crossing in the slot the bars are not made up of two groups of part conductors located side by side, but the crossing is effected through cuttings of the wide part conductors, the flat conductors after coming out of the slots undivided in the peripheral direction would be exposed with their full width to the end stray field, the consequence of this would be to give rise on this length to eddy current losses.

Now, according to this invention, the sides of the free bar ends are split by means of a cutting B extending to quite near the slot inlet, so that thus each bar end comprises two part conductor ends a_1 and a_2 or b_1 and b_2. These part ends are in electrical connection with one another by means of individual strips d_1 and d_2 and in such a manner that the part end a_1 of the left coil side located to the left in the direction of the periphery and the part end b_1 of the right coil side located to the right are connected to the same connecting strip, namely d_1, while the part end a_2 of the left coil side located to the right in the direction of the periphery and the left part end b_2 of the right coil side are connected with one another by the part strip d_2.

The two strips d_2 and d_3 run concentrically to one another and are separated from one another by an intermediate insulation g. Since in this way two branches of the split conductor part ends similarly influenced by the end stray field are connected in opposition, therefore a compensation of the induced E.M.Fs takes place and thus a reduction of the eddy current losses.

In Figure 1, the two part strips d_1 and d_2 arranged concentrically over one another, are not mutually crossed. If it is desired to avoid the current displace-

ment also in the strips themselves, then, as is known, the part strips can be mutually crossed. The crossing must, however, then be effected in such a manner that thereby the connection between the outer conductor part ends a_1 and b_1 or the inner ones a_2 and b_2 be maintained and that no changing of these connections takes place, that is to say, the crossing points are to be arranged in accordance with Figure 2 at two points k_1 and k_2 symmetrical with the length of the strip or generally in a number divisible by 2.

Each part strip can also be further subdivided in the manner that the bar part ends arranged over one another, as shown in the Figures, are not all embraced by one connecting strip, but only a group of them, so that the number of the part strips is correspondingly increased. The part strips can then be run partly concentrically over one another and partly side by side and be crossed together with an even number of crossing points. In the case of such multiple subdivision of the strip, the lower group of the bar part ends that are arranged over one another may be made longer than the upper group so that it projects, the connection of the part strips being thereby facilitated.

In another alternative, the part ends a_1 and a_2 or b_1 and b_2, lying side by side, of the bar ends split by the cutting B can be formed of different lengths and the long or the short part ends be connected together in such a manner that the connecting strips can be mounted side by side.

Generally, it will be sufficient to fork the bar ends by a middle cut in two equally wide part ends, if necessary, however, a multiple splitting can be effected by means of several cuts.

Having now particularly described and ascertained the nature of our said invention and in what manner the same is to be performed, we declare that what we claim is:—

1. The arrangement for reducing the eddy current losses in alternating current machines by splitting the ends of the conductor bars where they project beyond the core slots into two or more radial part ends, each part end being insulated from the other and so connected by connecting strips to the radially opposite side of the similar part end of the next corresponding conductor bar that the E.MFs induced by the stray field in the split conductor bar ends are neutralised.

2. The arrangement for reducing eddy current losses according to Claim 1, in which the conducting strips which connect the part ends of corresponding conductor bars run concentrically and are not crossed, or are crossed with an even number of crossing points.

3. The arrangement for reducing eddy current losses according to Claim 1, in which the part ends of the conductor bars are of two or more different lengths.

4 The arrangement for reducing eddy current losses according to Claim 1, in which the radially divided part ends of the conductor bars are subdivided concentrically, each subdivision being connected to a separate conducting strip.

5. The method of reducing eddy current losses in alternating current machines by splitting the ends of the conductor bars where they project beyond the core slots and interconnecting the split ends substantially as described with reference to the accompanying drawings.

Dated this 9th day of October, 1928.

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Redhill: Printed for His Majesty's Stationery Office, by Love & Malcomson, Ltd.—1929.

[This Drawing is a reproduction of the Original on a reduced scale.]

Fig. 1.

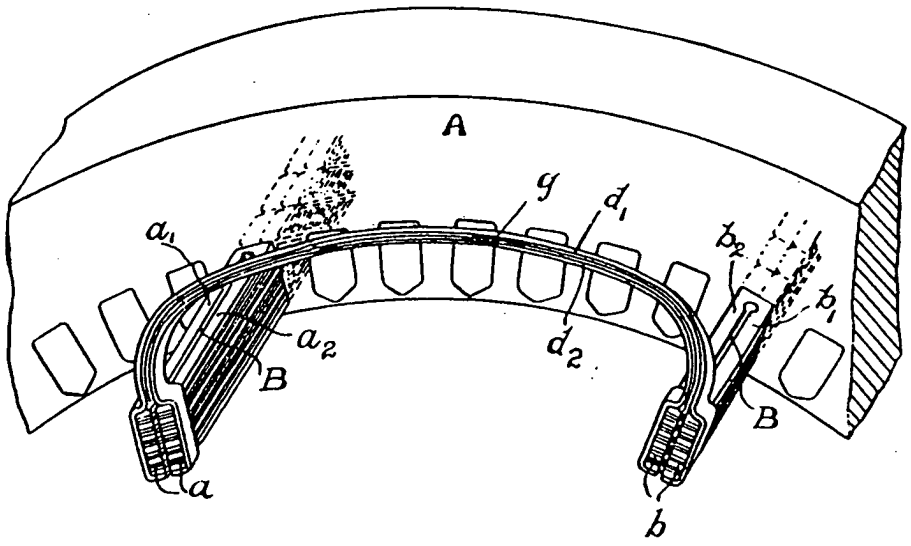
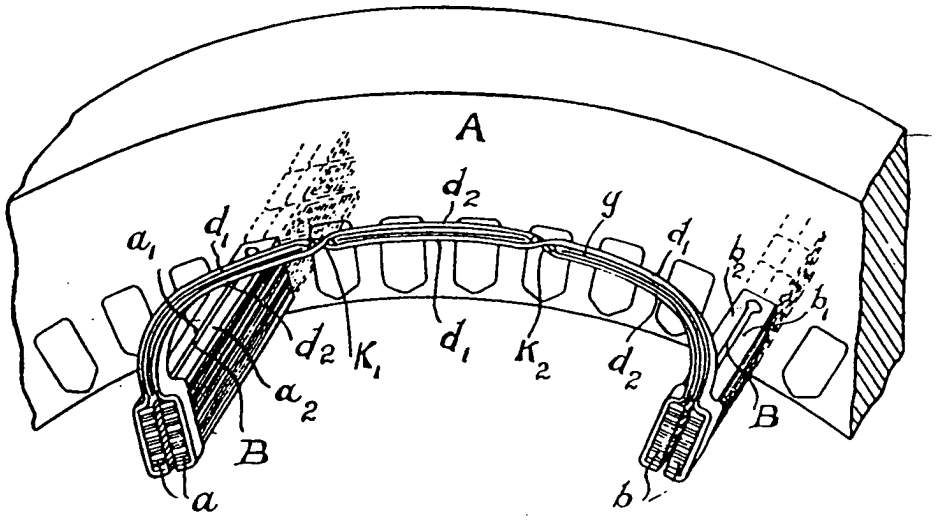


Fig. 2.



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